Investigating Dietary Routing of Carbon Isotopes in Archaeological Bone Collagen from Pokrovka (Russia) Using LC-IRMS

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Carbon isotopes of organic (collagen) and inorganic (carbonate) fractions of bone fossil remains are routinely used to investigate human and animal diets. The type of information that can be obtained from the two components is complementary. Collagen carbon is mainly related to the dietary protein sources, however non-essential amino acids can reflect energy sources in the diet. Bioapatite carbon should be representative of the whole diet, essentially lipids and carbohydrates, with only a minor contribution from proteins. Nonetheless, the source of carbon isotopes for the various body tissues has so far not been fully investigated and understood. As part of an ongoing palaeodietary and palaeoenvironmental study and in order to investigate the routing of dietary carbon into bone tissues we applied isotopic analysis to twenty Bronze Age sheep and human bones from the Pokrovka archaeological site in the Russian Steppe. The sheep and humans were recovered from the same graves and considered to be contemporary and part of the same trophic chain. We analysed bulk carbon and nitrogen isotopic values of bone collagen and d13C of apatite carbonate. In addition we also applied the new technique of Liquid Chromatography Isotope Ratio Mass Spectrometry (LC-IRMS) to analyse single amino acid carbon isotopes to investigate the sources of carbon that make up collagen (i.e. essential vs. non-essential amino acids). By comparing d13C values of the amino acids with bulk collagen and carbonate d13C values, we will discuss the potential of this approach to exploring the routing of essential and non-essential amino acids from the energetic and the protein components of the diet and how this can be used to interpret palaeodiet and environment. This study is the first to explore the relationship between amino acids, bulk collagen and apatite carbonate d13C values, and represents the first application of LC-IRMS techniques to Russian archaeological material.